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AEROSPACE, CIVIL AVIATION

French Syracuse-2 Satellite Program Described

AN890131 Paris ELECTRONIQUE HEBDO in French 30 Mar 89 p 10

[Article by Pierrick Arlot: "French Army Beefs Up Its Space Telecommunications"]

[Text] A contract worth Fr 10 billion has just been awarded to Alcatel as prime contractor to supply ground receiving equipment to the 6-year Syracuse-2 military space telecommunications program. A greater number of correspondents, two specialized fields of deployment—these are the two major improvements that will benefit the French Armed Forces. A "high point" is of enormous interest in the field of communications, especially in mountainous areas; thus, a relay located on a carefully selected mountaintop makes it possible to increase distances between correspondents and to avoid the obstacles that the topography can generate. On the planetary level, what could be more practical than a geostationary satellite? This is especially the case given that the French military forces are not concentrated in one region of the globe but are dispersed in countries that are more or less far away, depending on cooperation or assistance agreements.

Improving and Securing Communications

The military program launched in 1980 under the name the Syracuse-1 satellite radiocommunications system, with the purpose of developing a uniform military satellite telecommunications network, currently includes a space component integrated with Telecom-1 and a ground component comprising 26 ground stations—3 fixed stations located in Brest, Paris, and southern France; 12 mobile ground stations; and 11 naval stations. The deployment field scanned by the satellite covers Africa, the Indo-European continent as far as Pakistan, and South America.

However, no matter how sophisticated it may be, a satellite cannot operate forever. The limited life of Telecom satellites (about 7 years) led the Armed Forces Equipment Authority (DGA) to begin research in 1983 into solutions to the challenges posed by the military space telecommunications of the 1990's. For example, there is the requirement to increase the number and type of correspondents, as well as the need for enhanced protection against intrusion, listening, and jamming—the usual foes of any transmission.

How then is Syracuse-2 an improvement over Syracuse-1? The space component of the program will be incorporated into Telecom-2 satellites, which are slated to be placed by Ariane-4 in late 1991 and mid-1992. The satellite will use the same frequency bands (7.9-8.4 GHz for earth-to-space and 7.25-7.75 for space-to-earth) and the overall field of deployment will remain the same. On the other hand, two larger antennas will provide an enhanced transmission-reception capability in two specialized areas—the France-Central Europe area, and, thanks to the addition of an antenna with variable orientation, a mobile area of about 1,800 km in diameter within the overall coverage. The possibility of clandestine listening by spies outside these areas will be greatly limited by this "clean sweep" coverage.

In addition, the use of 5 transponders (instead of 2 for Syracuse-1) and an increase in the satellite on-board transmission power (40-W traveling wave tube amplifiers) will make it possible to connect a large number of correspondents. The Syracuse-2 program also calls for a fourfold increase in the number of receiving stations, for a total of 100 ground stations.

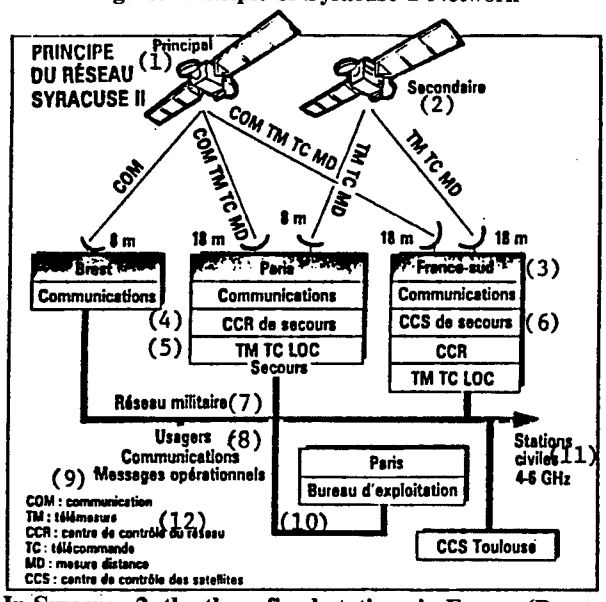
The Syracuse-2 ground component will comprise a network control center, along with old Syracuse-1 stations improved to adapt to the system's new capabilities, additional Syracuse 1-type stations, and a new type of station in the specialized areas (small-diameter aerials—0.5 m versus over 1.3 m currently); the latter stations will be harder to locate and will be installed on smaller carriers, such as nuclear submarines, medium-tonnage ships, or even jeeps. It should be noted that the Syracuse-2 network will be able to link up with the Armed Forces Integrated Transmission Network (RITA) currently employed by the French Armed Forces and, at some point in the future, with the Army's fourth-generation unit.

Alcatel the Big Winner

What is Syracuse-2's structure? The network's main stations are primarily the fixed stations in France; however, within the area served by the variable-orientation antenna, certain stations will be able to serve as relays for the secondary stations. Given the number of correspondents, shared, multiple-access utilization of the satellite's capability is planned. For the stations that will use the multiple access by frequency-sharing (AMRF) capability, modems will permit the simultaneous use of a voice link (2,400 bits/sec) and a graphics link (200 bits/sec); for those stations that will use multiple access by code sharing (AMRC), 74 bits/sec links (graphics or data), 2,400 bits/sec links (voice or data), or 16 bits/sec links (voice or data) will be possible.

The Alcatel susidiaries Alcatel-Espace, ATFH, and Alcatel-Telspace will supply the ground equipment; Alcatel-Espace and Matra have been producing Telecom-2 satellites since 1988. Some European firms, such as British Aerospace, Fokker, and MBB, will also be participating in this project.

Figure. Principle of Syracuse-2 Network



In Syracuse-2, the three fixed stations in France (Brest, Paris, and southern France) communicate with mobile ground stations via Telecom-2 satellites.

Key: 1. Main 2. Secondary 3. Southern France 4. Emergency CCR 5. Emergency TM TC LOC 6. Emergency CCS 7. Military network 8. Users 9. Operational messages 10. Operating agency 11. 4-6 GHz stations 12. COM: communication; TM: remote sensing; CCR: network control center; TC: remote control; MD: distance measurement; CCS: satellite control center

R&D Contract for Hermes Shuttle Awarded

AN890221 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English No 1490-2, 1 Jun 89 p 2

[Article: "Three Billion Francs for the Hermes"]

[Text] The final research and development contract for the Hermes space shuttle for the 1988-1990 period has been placed with Aerospatiale (industrial prime contractor) and Dassault (delegate for aeronautical matters) by CNES (National Center for Space Studies). The contract comes under the European Space Agency's Hermes Development Program, in which CNES is acting on behalf of the Agency. The contract will be manned by a special program team located at Toulouse and made up of engineers from the Aerospatiale Aircraft Division, Dassault and Deutsche Hermes. The deal represents ECU 415 million for the said period (approximately 3 billion French Francs). This amount includes the portions accounted for by Aerospatiale, Dassault and all the other European subcontractees associated in the program. Credits to the latter will be assigned on a geographical basis according to contributions of member states. The development phase convered by this contract will include:

- Final freezing of an aircraft design suitable for mission and sufficiently safe for crew;
- Mastery of all critical technologies: aerothermodynamics, materials, electric generation, software, etc.;
- Freezing interface conception in conjunction with other elements of the vehicle and orbital infrastructure: basically, the Ariane 5 and Columbus;
- Firm production proposals in terms of budget and schedule.

FRG: Cost Analysis of Space Projects To Be Published

MI890322 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 504, 29 May 89 pp 8-9

[Text] The planning of increasingly complex space projects poses an increasing number of questions concerning their operating costs. Europe so far has only a limited experience of, and ideas about, these operating costs.

The BMFT [FRG Ministry of Research and Technology] has commissioned the business consultants, MST Unternehmensberatung GmbH in Munich, to carry out a wide-ranging analysis of the subject whose results are now available. A large number of space systems such as satellites, transport systems, and space stations were examined on an international basis.

For cost classification purposes, the analysts working on the study designed a cost structure that followed the course of the space projects. Literature searches and extensive inquiries at institutes and companies involved in space were used to determine the costs.

The central finding of the study is that in proportion to production costs, the operating costs of the space systems under review are relatively small: from 4 to 8 percent. In the case of long-term space programs (for instance, the U.S. Space Shuttle), it therefore takes about 15 years before the accumulated operating costs reach the level of the system's production costs.

A comparison between operating to production cost ratios in space activities, aviation installations and systems, and the steel industry showed interesting findings. For example, the annual operating costs of a commercial airline or an industrial plant, related to the purchase price of the installation, was as much as ten times greater than costs in the space sector.

In contrast, the operating to production cost ratio of an experimental aircraft built for research purposes corresponds to that in the space sector. The study concludes that the operating to production cost ratio for space is normal for large-scale research. The study will be published soon, and can be obtained from: MST Unternehmensberatung GmbH, Brunnenstrasse 3, Munich, [FRG] Tel. 089/2609443 or 444.

Aerospatiale To Buy 10 Percent of Spain's CASA

MI890285 Rome AIR PRESS in Italian
26 Apr 89 p 794

[Text] Aerospatiale may acquire a 10 percent share in the capital of CASA [Construcciones Aeronauticas S.A.], the leading Spanish aerospace company. Henry Martre, president of the French company, announced in an interview with LE FIGARO: "We are willing to join CASA if Madrid makes the proposal." However, he added that in his opinion, this would take at least 2 years. CASA is the minority shareholder (4 percent) of the European Airbus Industrie consortium and is working with Aerospatiale on a feasibility study developed jointly with Aeritalia and related to a new 100-seater commercial aircraft. An increase in CASA's capital is expected. The company's shareholders include the Spanish government through INI [National Institute of Industry], the Spanish equivalent of the Italian IRI [Institute for the Reconstruction of Industry], the German company MBB [Messerschmitt-Boelkow-Blohm], and the French company Avions Marcel Dassault.

The interview with Martre focused on relations with Dassault: "Working together involves common strategy and we have not reached this point," he said in reference to recent initiatives taken in this direction and to statements made by the Defense Minister Jean-Pierre Chevenement. Matre stated: "Given the present world market for combat aircraft, it is not certain that such an operation would strengthen Aerospatiale." Meanwhile, Aerospatiale has created jobs for most of the 600 Dassault employees affected by the closure of the Colomiers plant. In regard to Aerospatiale's future, Martre confirmed the estimated 10 percent average increase in sales, provided the dollar exchange rate remains at Fr 6.4.

Italian-USSR Space Cooperation Programs Established

MI890280 Rome AIR PRESS in Italian
19 Apr 89 p 737

[Excerpts] "Austrian, Japanese, German, and perhaps even American scientists will take part in the Soviet Union's next space launches, and we also hope to have an Italian scientist soon." This statement was made by the Soviet cosmonaut and researcher, Gennadiy Mikailovich Strekalov during a visit to Italy, where he was a guest at the Milan April Fair. AIR PRESS met him at FIAR. The cosmonaut's visit to the Italian company coincided with the announcement of the signing of important agreements with Soviet government bodies and research institutes, as well as the inauguration of FIAR's new center for the integration and assembly of equipment and space systems.

Strekalov is 48 years old, married with two daughters, and has a degree in engineering. He is a hero of the Soviet Union with the Order of Lenin, was twice awarded the "Gold Star" medal, and made his first space flight in December 1980. Strekalov was accompanied by M.M. Dubocik [as published] of Glavkosmos, a Soviet space organization and by Consul M. Kovolev, who in recent years has greatly contributed to the development of industrial relations between Italy and the Soviet Union.

Introducing the Soviet guests, FIAR President Eng Silvano Casini emphasized that the company has been present on the European space scene for over 25 years. This has led to collaboration with Soviet space agencies in other activities such as small satellites for scientific or special applications. Eng Casini pointed out that "having Strekalov cut the ribbon of our new center is a symbolic gesture of the developments we would like to see in our relations with the Soviet Institute for Space Activities. There are interesting prospects for highly advanced collaboration."

Dr M. Mensa described the programs under development. It is well known that FIAR, with its high technology systems and components, plays an important role in all major European programs. He mentioned some examples such as collaboration with CISE [Center for Data, Studies, and Experimentation] for the development of gallium arsenide photovoltaic cells whose energy conversion efficiency is almost twice that of the more traditional silicon cells used in space. The new cells will be placed on the Swedish scientific satellite "Freja" within 2 years. In telecommunications, FIAR will construct the first prototype of the millimetric wavelength transponder or transceiver for the ESA (European Space Agency). This will permit high speed communication between satellites. Dr Mensa added: "Our space activities are not limited to the space sector alone. For example, we have developed small earth stations which will be used by the FAO [Food and Agricultural Organization] to transmit agricultural and meteorological data. One of these terminals for the exchange of data or telex messages with mobile means and fixed stations is called 'Prodat.' These were proposed to the Italian Space Agency and within 2 years, one hundred or even two hundred terminals of this kind may be supplied to selected users (for example, the USL [Local Health Units] or the Civil Defense Service.)" [passage omitted]

The second FIAR-Soviet Union joint program is "Regata." A series of small satellites weighing a few hundred kilograms, called "Small Spacelab," will be put into orbit around the sun and will be used to carry out astronomical measurements of the sun and the interplanetary plasma. FIAR is strongly convinced that a future exists for this "minisat" given its very low costs. If Italy and the Soviet Union each invest 30 billion lire for the development of this program, the industrial production costs will amount to approximately 7 billion lire for each satellite and may drop to 5 billion lire for a 200-kilogram satellite. This investment is therefore easily within the reach of universities. Another FIAR executive, Eng G. Moreth, outlined all the other areas of cooperation with the Soviet Union. Interesting programs are underway in the fields of robotics, artificial intelligence, agricultural meteorology, building automation, quality management,

and financial management. FIAR has also recently signed an agreement with the Soviet Academy of Sciences' Data Processing Center covering artificial intelligence techniques. This agreement involves developing innovative methods to automatically acquire, maintain, and increase knowledge. One of the fields of application is automated systems in factories (CIM, or Computer Integrated Manufacturing). Other potential areas for agreements that are still being worked out include environmental protection and agricultural meteorology, in particular. Here, FIAR plays a leading role both at the Italian and European level, with the sophisticated technology, equipment, and systems provided by the FIAR-controlled SIAP company of Bologna.

[passage omitted]

UK: GEC Avionics Develops Radar System for Tornado

MI890318 Coburg OPTO ELEKTRONIK MAGAZIN in EnglishVol 5 No 2, Mar 89 p 205

[Text] The world's first contract for production of an aircraft terrain reference navigation/terrain following system has been awarded to GEC Avionics for its Spartan system. The order was placed by Panavia GmbH, and forms part of the UK Tornado IDS Mid-Life Update (MLU) program.

Equipped with Spartan, the Tornado IDS pilot will for the first time be able to fly at low level with great accuracy without using external navigation sources or activating his radar. These capabilities will considerably enhance the ability of the Tornado to remain undetected when operating in the modern, hostile electronic warfare environment.

Developed by GEC Avionics Combat Aircraft Controls and Guidance Systems Divisions, Spartan has been extensively and highly successfully flight tested on a variety of military aircraft in the UK and the United States. Following early developmental flight tests at RAE Farnborough and Bedford, operational proving tests have been carried out recently on Tornado aircraft in the UK and the Advanced Fighter Technology Integration (AFTI) F-16 in the United States.

Spartan provides accurate, drift-free navigation by comparing a series of radar altimeter readings, which build up a picture of the overflown terrain, with surveyed data from a digital map store. By matching these profiles, Spartan is able to rapidly calculate an accurate, three dimensional position for the aircraft. Simultaneously, Spartan looks ahead through the database to build up a profile of the terrain ahead of the aircraft. This information is then used to calculate steering commands for the autopilot to maintain a constant height separation (preset by the pilot) between the aircraft and the ground. A record of all known vertical obstructions, also maintained within Spartan, ensures safe separation from cultural features such as high tension cables and pylons.

Housed in a single ¾ ATR short box, the Spartan system for Tornado contains a database capable of storing an area roughly equivalent to three times the UK—600,000 square kilometers. This rugged, solid-state store can be swiftly reprogramed to enable additional features to be incorporated, or to change the area of stored map to cover a different region of operational deployment.

Additional Notes

Spartan is one element in GEC Avionics' Total Terrain Avionics (T^2A) system. T^2A brings together a range of the company's latest equipment to form a complete suite of systems for day and night, all weather, low level operations. T^2A incorporates GEC Avionics' Digital Color Map Unit (DCMU), Spartan, Head-Up Displays, Head-Down Displays, Laser Obstacle and Cable Unmask System (LOCUS), and GEC Sensors' Forward Looking Infrared (FLIR) system.

Recently proven in U.S. flight trials, GEC Avionics LOCUS laser radar uses a covert CO_2 laser to detect unknown obstacles during flight. These hazards are then displayed to the pilot on the Head-Up Display.

GEC Avionics supplies a range of equipment for the Tornado, including the Digital Autopilot, Combined Stability Augmentation System, and a complete suite of Head-Down Displays.

AUTOMOTIVE INDUSTRY

Volvo Adopts New Automated Assembly Methods

36980240b Duesseldorf HANDELSBLATT in German 13 Jun 89 p 22

[Text] Stockholm. By introducing modern production methods without an assembly line, Volvo, the Swedish auto corporation, was able to increase productivity in its new plant in Uddevalla on the country's west coast. While absences from the job due to sickness are between 20 and 25 percent in the entire corporation as a whole—something which indeed is extremely high—the plant management in Uddevalla has registered only 8 percent.

In this new plant, Volvo is putting its money on the motivation of the workers. Here, 48 work teams, which are between 8 and 10 members, each, assemble four cars per work day. On driverless transport vehicles, the four car bodies are moved into the work room each day; the work team is then responsible for installing the engine, the gears, the wheels, the windows, the doors, the seats, etc.

This is done as part of a swift swap between the various work tasks, whereby the team of course is responsible for arranging its work and for complying with the specified production pace. The team also, quite on its own, makes sure that the necessary individual parts are ordered at the necessary rate from the warehouse; if the team damages a part, it is responsible for the damage.

"The brain and manual labor are once again reconciled," rejoiced Volvo's passenger car division chief Roger Holtback, who views this as an epochal event: "Henry Ford introduced the assembly line in 1914 and now Volvo is doing away with it." On paper, the principle of work function subdivision, which constitutes the foundation of assembly-line production, may represent a high point in rationality; in practice, according to Holtback, it destroys worker motivation and creativity.

This, at any rate, is the lesson learned by the Swedes in Uddevalla. The clear contrast between days lost due to sickness at this assembly plant and the rest of the corporation (the top management has already threatened the labor unions with shifting parts of the production effort abroad, if this does not change), would appear to be an indication that the transfer of responsibility to the individual workers is paying off also in production statistics and profit. This year, the Uddevalla Plant is to assemble about 10,000 cars; that accounts for 2.5 percent of the annual car output at Volvo. But then the figures are to go up quickly: 24,000 next year and 36,000 in 1991. Because all they do at Uddevalla is assemble cars, the plant is flexible so that it does not depend on screwing together only the 700 Series models. It could also finish other cars, basically with only short conversion times.

The management has emphasized that this rather free way of shaping up the work day in the new plant is attractive especially for those workers who have a proud professional attitude and who are not only aiming at making money quickly. Technical qualifications are not absolutely necessary here: Uddevalla also likes to employ former butchers, nurses, and housewives, provided they are ready to learn and to do good work.

At this time, the new plant employs around 700 persons, including administrative personnel and other higher-level employees; by 1991, the figure is to rise to 1,000. It is interesting to note that 44 percent of the workers are women. Volvo tried to reach a target of 40 percent but this type of work is obviously so attractive that the quota was topped right away.

Motivation Ahead of Qualifications

In Uddevalla, Volvo has implemented a joint responsibility principle. Here, quality defects in the ready-assembled passenger cars are penalized by wage deductions. Completely guided by the Japanese principles, the Swedish management is less concerned with quantity than with quality in the finished product: basically, there are to be no Monday-morning cars in Uddevalla.

After initial experiences (so far, 5,500 cars have been assembled in Uddevalla), the concept of responsibility transfer seems to have proved itself. If one raises the requirements, this, if anything, acts as an incentive, rather than as additional pressure, compared to monotonous, nerve-deadening, and stress-promoting assembly-line work. "Here, the work makes sense," said one of the employees. "So, you simply do not report sick if there is basically nothing wrong with you; and you get hopping mad if you run into a fellow worker at the soccer game who, in the morning, told the secretary that he could not come because he felt bad."

Europe's Answer to "Ant Solidarity"

Visitors from abroad have hailed the Uddevalla model because it can be understood as the European response to the Japanese model of ant solidarity. Precisely the fact that quality shortcomings in European production enabled the Japanese to win victory after victory in cars (and in many other products) is a basic problem for Europe. The Volvo experiment could be a signpost here.

Of course, Sweden is not necessarily typical of Western Europe. On the basis of its tradition, the country has developed in its citizens a collectivist basic view which harmonizes nicely with the concept of the mutually responsible members of a work team but which cannot be simply transferred to Germany or France or even Italy without adjustments.

Swedes are typically "honest, reserved, peaceful, taciturn, and somber but also efficient, well-organized, pragmatic, and practical"—according to the German-Swedish Chamber of Commerce in Stockholm in a review of a book by Professor Ake Daun on this topic. In other words, they are just the right participants to be put into work teams. And this analysis also confirms that everything is peaceful there: "The Swedes have an unemotional nature, except when they drink." But they do their drinking over the weekend, never during the week or certainly not during working hours. And thus the Swedes, in this area of their lives, likewise gladly and voluntarily are guided by the wishes of the employer.

DEFENSE INDUSTRIES

Italy, France To Develop Antiaircraft Missile Systems

MI890333 Rome AIR PRESS in Italian
14 Jun 89 p 1179

[Excerpts] The latest news in Paris is the founding of GIE EUROSAM by Selenia (IRI-Finmeccanica) and the French companies Thomson and Aerospatiale. GIE (Economic Interest Group) is aimed at developing a family of antiaircraft missile systems for the two countries' armed forces. The first of these is a spotting defense system for the two Navies. This, however, is a system capable of being developed into more long-range versions for use either on board or on the ground because of its extremely modular conception. This fact alone is important for the program's size and level of innovation. What is even more important—at least for our country, as was emphasized to AIR PRESS—is the fact that Italy

succeeded in becoming an equal partner in such an important undertaking. This is uncommon recognition for Italian technology, and Selenia's technology in particular. It is certainly not "honorary" recognition, but the result of decades of work, large investments, and market and technical success; perhaps it would be worthwhile to run through the most significant stages.

All the missile systems developed by Selenia were designed to stay on the market beyond the end of the century, with appropriate improvements and additions permitted by new technologies in relation to the evolution of threats and future operational requirements. At any rate, given the lengthy period necessary for the development of a missile system (10-15 years), Selenia began to develop a new line of missiles in the early eighties that is destined to succeed the family of systems based on "Aspide" ("Albatros," "Spada," "Skyguard/Aspide," and medium-range air-to-air systems).

The new systems will be based on the use of a new missile ("Idra") with highly innovative features. So far, Selenia has developed the architecture, main subsystems, and basic elements of the related weapons system of "Aspide's" natural successor (the MARA computer, the "Magic" high definition display, and the creation, currently under way, of the EMPAR [expansion not provided] multipurpose radar which is being developed in collaboration with the English company, Marconi). All of these programs have been developed in agreement with our armed forces, and parts have even been developed with their financial support. This has entailed an overall investment of approximately 400 billion lire by Selenia over the last six years.

In the meantime, the European armed forces were starting to realize that because of the economic and technical dimensions involved, the development of major defense systems must be accomplished through international collaboration wherever common operational requirements could be defined. This could be the case for antiaircraft missile defense, an area in which the Italian and French Navies had similar needs. In France, Aerospatiale and Thomson were already in the initial stages of setting up a development program based on the new "Aster" missile to meet this need.

Once Selenia, Aerospatiale, and Thomson had verified the high degree of possible overlap between their respective missile programs, and had reciprocally recognized the validity of the accomplishments that had already been achieved, an agreement for collaboration on a joint program was signed in 1987. This collaboration met with the full approval of the two countries' armed forces, which signed a preliminary agreement in October 1988 for the joint development of a family of surface-to-air missile systems meeting their common technical and operational requirements. This agreement was also open to participation from other countries. As a result, the national development of "Idra" and most of the components used by its weapon systems converged under this bilateral agreement. A Project Management Office (PMO) was then set up in Paris with the task of handling the joint initiative on behalf of the two governments. In agreement with the PMO, Selenia, Aerospatiale, and Thomson defined the technical and economic characteristics of its programs, presenting the relative proposals to the two governments. These proposals also provide for the participation of other French and Italian industries in the sector. Italian participation is expected to include OTO Melara, SNIA BPD, Contraves, Marconi, Litton, SEPA, Nardi, and other companies according to their respective areas of expertise.

The founding of GIE EUROSAM for the working management of the industrial collaboration among the three companies heading the program has finally formalized this lengthy collaboration, and gives a common cause to the highly qualified mixed French-Italian team that has been working at full swing on the technical and contractual definition of the program since 1987.

LASERS, SENSORS, OPTICS

High-Frequency Ultrasonic Sensors Produced

AN890219 Paris FRENCH TECHNOLOGY SURVEY in English Jun 89 p 17

[Article: "New High-Frequency Ultrasonic Sensors"]

[Text] Biosonic is a new company set up by research workers at the optical/acoustic/electronics laboratory at the University of Valenciennes: It is utilising a new technology for the industrial production of high-frequency ultrasonic sensors (between 10 and 500 MHz) for non-destructive inspection and for biological and medical engineering. With these sensors it is possible to "see" beneath the surface using sound. Biosonic can provide a complete service to resolve any ultrasonic inspection problem encountered by industrialists. For this purpose the Biosonic company has access to the bonding and thin-film technology of piezo-electric materials developed in the optical/acoustics/electronics laboratory. With this know-how it can produce a large number of non-standard products using piezo-electric materials, such as PZT ceramics, lead metaniobate, modified lead titanate, and single crystals of lithium niobate. The different components can be bonded on a delay line, possibly with a number of matching layers using an epoxy glue or by the vacuum deposition of metal films. One example is a planar probe for biological applications, which has the following characteristics:

- a silicon delay line, 5 mm long and 10 mm in diameter,
- the lithium niobate piezo-electric element bonded using indium,
- central frequency for 200 MHz,
- pass band: 140 MHz at -3 dB.

High-frequency probes of this kind are used for applications such as biological and medical engineering or for nondestructive testing.

When used for characterising biological cells and soft tissues, the high ultrasonic frequencies actually produce a spatial separation of the different structures being observed. Similarly, miniaturisation of these sensors for ultrasonic endoscopy should permit investigations of fragile zones and those to which access is delicate.

UK: Marconi Produces First European Ultrawideband Microwave Link

MI890319 Coburg OPTO ELEKTRONIK MAGAZIN in English Vol 5 No 2, Mar 89 pp 205-206

[Text] Europe's first ultrawideband fiber-optic microwave link has been produced by Marconi's Electro-Optics Division at Stanmore, Middlesex.

The company has successfully demonstrated a 2-20 GHz optical fiber-optic transmission line of 1 km length, a new technology offering vastly superior bandwidth and insertion loss compared with existing coaxial cable or waveguides. It also gives immunity to electrical interference.

Bandwidth capability is equivalent to 3,000 television channels or six million telephone conversations transmitted simultaneously down a single strand of optical fiber.

In addition, man optical carriers can be multiplexed down the same fiber—with good isolation—using slightly different wavelengths. This significantly increases the information handling capability of the transmission link.

The link differs from existing telecommunications links—which are much narrower bandwidth—in its use of an external modulator to impose the information on the optical carrier. The electro-optic modulator has been specially developed at the GEC-Marconi Research Center and alleviates many problems encountered with directly modulated semiconductor lasers, providing higher fidelity transmission.

There are additional advantages in size and mass over conventional copper wire cables.

Typically, a single optical fiber is only one-eighth of a millimeter in diameter. Therefore many can be carried in an underground cable of, for example, 25 millimeters diameter.

The system's wide bandwidth is the ideal solution to such needs as signaling to and from remote antennas, and data transmission in direct broadcast from satellites or high definition television.

MICROELECTRONICS

LETI Producing Thinner IC's in JESSI Program

AN890217 Paris FRENCH TECHNOLOGY SURVEY in English Jun 89 p 1

[Article: "A Resolution of 0.2 Micrometer in Optical Microlithography"]

[Text] The French National Microelectronics Research Center (LETI) is working in close cooperation with a number of European industrial companies, especially SGS-Thomson, in the JESSI programme (Joint European Submicron Silicon Initiative). While building complete systems such as a 16-Mbit EPROM (erasable, programmable read-only memory) (0.5 μm) with SGS-Thomson, LETI is devoting substantial efforts to processes involving subsequent generations (0.3 μm). In this context a new and substantial step forward has been achieved in the race to produce thinner integrated circuits; it has been possible to produce 0.2 μm lines 0.2 μm apart in a resin only 0.8 μm thick, using an original process with an excimer laser at a wavelength of 248 μm and dry development. This process can be applied to the manufacture of integrated circuits since the resolution is independent of the topography and the reflectiveness of the different layers, the image being formed on the surface. This mask is also perfectly compatible with the engraving processes in current use. The contact masking technique used at present is clearly not applicable on an industrial scale for very complex circuits, but the quality of results obtained is such that a resolution of 0.25 to 0.3 μm on excimer laser photo repeaters are under development by a number of companies. While ten years ago most microelectronics specialists believed that optical microlithography would be limited to resolutions of 1 μm, it has recently become clear that this "ultimate limit" is continuing to recede.

FRG: New Manufacturing Method for Microstructures Developed

MI890260 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 500, 31 Mar 89 p 6

[Text] A new method for producing metal microstructures has been developed by the Karlsruhe Nuclear Research Center in cooperation with Messerschmitt-Boelkow-Blohm. The procedure is based on structuring the surface of films "fissuring" with the aid of shaped microdiamonds and then joining the films to form microstructures having typical overall dimensions of a few centimeters. These microstructures contain several tens of thousands of microchannels per square centimeter measuring as little as a few thousandths of a millimeter, while the length of the channel can reach several decimeters. The channels can be packed together so closely that the massive looking metal body becomes practically transparent in the direction of the channels. Structures of this kind have a wide range of applications that are currently being examined with industry.

Examples of technical applications that have already been tested successfully are microheat exchangers for special applications, and X-ray collimators for research. In the first case, by packing the microchannels very closely together it was possible to house a heat exchanger surface of 150 square centimeters in a cube measuring one cubic centimeter. This makes it possible, for example, to transfer 20 kW between water flows with a 60° C temperature difference in a one cubic centimeter block. The specific thermal output is approximately 100 times greater than in conventional plate heat exchangers. For such microheat exchangers, with their hair-like channels, fluids flowing in clean, closed circuits must have a high degree of purity. A wide range of materials are available for use so that even corrosive liquids or gasses and high temperatures can be used.

An aluminum collimator with a directional definition of 42 arc seconds was produced for the direction-dependent spectral analysis of X-rays with the aid of a double crystal spectometer. The collimator was tested at the Max Planck Institute for Plasma Physics in Garching. Its smallest channel is about 20 micrometers wide and it has an overall length of 200 mm, which is five times shorter than the equipment of this kind used to date. In addition to the advantage offered by its reduced length, this kind of mechanically-produced compact collimator also has greater optical transparency, which is important for measuring X-ray sources with weak intensity.

The Karlsruhe research center's current development work is directed at opening other fields of application to this technology, such as thin filters with identical pore openings, low impedance and high mechanical stability, or optical lattice structures with high aspect ratios and catalyst carriers for special uses, support surfaces with defined surface structures for cell and microbe fixing, and cooling elements for microelectronics.

ESPRIT II Project for Chip Packaging Described

AN890169 Paris ELECTRONIQUE HEBDO in French 13 Apr 89 p 32

[Article by Frederic Fassot: "Perfecting the Packaging of 800-Input/Output Chips"]

[Text] The interconnection of chips measuring 15 millimeters on a side with up to 800 outputs by tape automated bonding, or TAB connections, at the rate of 50 to 75 µm is more than wishful thinking; it is the challenge of an ESPRIT project led by Bull.

As part of the ESPRIT II program, an ECU 25 million project (Fr 176 million) has just gotten off the ground that aims to provide solutions for the interconnection of complex electronic systems. Entitled "Advanced Packaging for High Performances" (APACHIP, ESPRIT 2075), the project's main objectives are to develop advanced interconnection and encapsulation technologies for complex VLSI integrated circuits and to contribute to the creation of a European supply source for materials and products that will help attain this level of performance.

Project participants include Bull, the project leader; GEC-Marconi (Great Britain); Hoechst-CeramTec (FRG); Lemo of Grenoble (France); MCTS (France); the National Microelectronics Research Center (Ireland); Siemens (FRG); and Souriau (France).

Evaluating Marketable Technologies

Packaging is an essential strategic element in the development of complex electronic systems, because the increased performance of VLSI integrated circuits (bipolar, MOS, BiCMOS, etc.) cannot be used to its full potential without the simultaneous development of packaging techniques. Progress is therefore necessary with regard to both the interconnection of chips on the same substrate without protection of each individual chip (multichip technology) and the encapsulation of one chip in one package (single-chip technology). This desire to avoid favoring one area over another (multichip technology cannot completely replace individual encapsulation in all cases) clearly reflects the project's spirit.

The aim is not so much to develop new interconnection technologies as to refine existing methods by pushing them to their limits. By the project's completion, the partners hope to have interconnected 15-millimeter chips with up to 800 output by TAB connections at the rate of 50 to 75 µm on an advanced 200 x 200 mm printed circuit or a 100 x 100 mm multilayer thin polyimide at the corresponding rate. This level of performance cannot be achieved without new developments in the modeling of the electrical, thermal, and mechanical aspects of the packaging and in the relevant processes and materials. This can be said to be the purpose of the group, which, in addition to two universities, comprises potential users of the project's results (Bull, GEC-Marconi, Siemens) and European suppliers of packaging products (Hoechst-CeramTec for ceramic substrates, Souriau for the development of connectors, and MCTS for the supply of TAB tape).

In addition, the fact that two development activities are being organized simultaneously on substrates intended for TAB tape-packaged chips (a substrate of the advanced printed-circuit type and a multilayer thin polyimide with copper conductors) clearly shows that the project is not interested in achieving technological feats merely for the sake of it but to make packaging solutions cost effective.

TAB Tape at a Rate of 50 to 75 m

VLSI circuits will be interconnected through TAB technology, which consists in putting a chip on a tape bearing an interconnection pattern (Inner Lead Bonding) by way of gold embossments deposed in a vacuum and reinforced electrolytically on the chip. The tape is then placed on the interconnection substrate in the same way

(Outer Lead Bonding). This interconnection method is not new, and Bull is one of its pioneers. The aim of the project's participants is to refine it by pushing it to its limits.

At present, the general achievement in this area has been a rate of 125 or even 100 µm. The group aims to achieve a rate of 50 to 75 µm. This goal requires, among other things, the development of a new type of TAB tape. MCTS, a French manufacturer of this kind of product and a world leader in this field, will be responsible for the development of the tape, which will subsequently be marketed in Europe. Siemens and Bull will be specifically responsible for TAB technology. As for the substrate that the chips will be placed on, the investigation into advanced printed circuits with openings drilled by laser will be conducted by Siemens and GEC-Marconi, whereas the multilayer thin polyimide solution with copper conductors will be developed by Bull and Hoechst-CeramTec. Souriau will be responsible for developing connectors to be used for the testing or connection of multichip or single-chip modules on printed circuit. Although target electrical performances of the systems being developed have not been revealed, the connectors are expected to be able to run at 1 GHz.

Dissipating Power of 20 W/cm^2

The project will also look into the possibility of reconfiguring connectors (other dimensions, etc.). Finally, the project will have to develop improved cooling techniques capable of allowing thermal dissipation of 20 W per cm^2, or up to 40 W per cm^2 for some chips. To achieve this, methods of cooling by air, by immersion in a liquid, or by forced circulation of a fluid will be developed. Siemens will also conduct research to develop a testing method for bare substrates using plasma illumination (illumination of a path end by a plasma discharge and verification of the presence of the discharge at the other end) to monitor the continuity of paths. LEMO, the research laboratory of the Polytechnic Institute of Grenoble, will work on the development of electric simulation and modeling devices. Evaluation of acoustic microscopy for the nondestructive inspection of flaws in the packaging and interconnection structures will be carried out by the NMRC in Cork, Ireland.

During the first 2 years, efforts will focus on the description or basic technologies and the development of demonstration vehicles (experimental multilayer substrates, etc.) that will not have direct operational applications. The second half of the project will then be devoted to the development of a certain number of functional applications based on the development of the technologies described. The actual applications of the project are expected to involve data processing, rapid commutation, and control. In addition, APACHIP is linked to other ESPRIT projects, such as IDPS "One Month Silicon," BASE, and TIP M2 "Supercomputer"; all of these projects are related to the design of semiconductors. APACHIP's task will be to provide packaging solutions for these new chips; discussions regarding adequate packaging will have to have begun by the time the integrated circuits are designed. This work is expected to result in major advances for information processing, telecommunications, and industrial applications.

Finally, since the various project participants are members of organizations involved in standardization, advances in this area are expected. They involve, in particular, TAB technology and packaging APACHIP represents an ECU 25 million program, of which half is being financed by the EC. The human resources investment by the project participants represents 180 man-years over a period of 4 years.

CNET-SAGEM Plant To Produce Flat Screens

AN890218 Paris FRENCH TECHNOLOGY SURVEY in English Jun 89 p 3

[Article: "Active Matrix Flat Screen: The GIE (Economic Interest Group) 'Planecran'"]

[Text] In December 1988, the National Telecommunications Research Center (CNET) and the Company for General Electricity and Mechanics Applications (SAGEM) signed the papers setting up the Planecran Economic Interest Group (GIE). This was a decisive step in the development of liquid crystal flat screens driven by an active matrix of thin film transistors, produced using technology developed in CNET research. The basis for the Planecran GIE will be a pilot plant now being installed at CNET Lannion, which will come into service in June 1989. This plant will develop and produce black and white screens notably for applications in remote control and computing, and colour screens of the videophone type. The modules, consisting of the screen and its control electronics, will be assembled and evaluated by SAGEM at its works near Paris made available to the GIE. The decision to proceed to the industrial stage proper will be taken by SAGEM during the year 1990; this will depend on an analysis of the market. It uses only two masking levels, while most of the competing technologies require up to seven or eight masking levels. This fact, which reduces the number of steps in the process, should also benefit the cost of production. Now that the feasibility of producing screens by this technique has been demonstrated in the laboratory, it has to be confirmed in pilot plant production: This is the main aim of the development phase now in hand in the framework of the Planecran GIE.

SCIENCE & TECHNOLOGY POLICY

EC R&D Exchange Program With Austria, Norway Proposed

AN890216 Brussels EC INFORMATION MEMO in EnglishNo P-26, May 89 p 1

[Article: "Researchers' Europe: Norway and Austria To Take Part in the Science Programme"]

[Text] The Commission of the European Communities has just proposed that the member states conclude

cooperation agreements with Norway and Austria which will enable these two countries to participate in the Community programme aimed at encouraging cooperation and exchanges between European research workers.

This programme, called the Science programme, was approved on 29 June 1988, and has a budget of ECU 167 million for the period 1988-1992.

The contribution to be made by Austria is put at ECU 3.2 million and that of Norway at ECU 2.3 million.

Stop the Brain-Drain

Launched experimentally in 1983 and taken up by an action plan for the years 1985-1988, this initiative has so far enabled some 3,000 European research workers to be involved in this cooperation between European partners. In concrete terms the mobility of research workers is made possible, and young scientists are able to take part in advanced research programmes in other Community countries. This programme is, therefore, helping to prevent the brain-drain: Between 1982 and 1985 almost 7,000 European research workers emigrated to the USA. By 1992, thanks to the Science programme, some 7,000-8,000 research workers in Europe will have been able to take part in exchanges and be involved in scientific cooperation on a full-time basis. A crucial political problem is involved here, since the credibility and scope of European research teams are at stake: The hope is that in the long term, Europe will have available real cooperation networks comprising 5 percent of all European research workers, as against only six scientists of every thousand at the end of 1987. The Science programme covers practical aspects such as research grants, advanced training courses, scholarships, laboratory twinning, operating contracts, and specific measures designed to help the mobility of research workers (health insurance, pensions, etc.). The areas considered to be the most important for the Science programme, because of their multidisciplinary nature, are mathematics, physics, chemistry, life sciences, and earth and marine sciences.

EC Re-Examined Proposal for 'Monitor' Program

AN890220 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES in English No C161, 28 Jun 89 pp 12-19

[EC Document: "Re-Examined Proposal for a Council Decision Adopting a Community Programme in the Field of Strategic Analysis, Forecasting and Evaluation in Matters of Research and Technology (Monitor) (1989 to 1992)"—COM(89) 270 final]

[Text]

Part I

The Council of the European Communities,
Having regard to the Treaty establishing the European Economic Community, and in particular Article 130q (2) thereof,

Having regard to the proposal from the Commission, In cooperation with the European Parliament, Having regard to the opinion of the Economic and Social Committee,

Whereas Article 130k of the Treaty states that the framework programme shall be implemented through specific programmes developed within each activity; Whereas, by Decision 87/516/Euratom, EEC, as amended by Decision 88/193/EEC, Euratom, the Council adopted a framework programme for Community activities in the field of research and technological development (1987 to 1991), providing for activities in the fields of forecasting and assessment in science and technology and in evaluation of programmes;

Whereas the quality and independence of the evaluation of each research action programme should be maintained within the context of an evaluation procedure applicable to all research activities at the European level;

Whereas Decision 87/516/Euratom, EEC provides that a particular aim of Community research shall be to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at the international level and that Community action is justified where research contributes, inter alia, to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas it is intended that the Monitor programme should contribute to the achievement of these objectives;

Whereas the growing impact of science and technology on social and economic life reinforces the role and utility of analysis of the social and economic consequences of developments in science and technology;

Whereas several important initiatives have been taken in the Member States in matters of programme evaluation, forecasting, and technology assessment; Whereas the Commission, in carrrying out its duties regarding evaluation of R&D activities, must have the support of reliable methods, appropriate indicators, and a network of experienced European specialists in order that the effectiveness of its evaluations and its capability to measure the impact of R&D activities are improved;

Whereas the evaluation report of the FAST II programme has been taken into account;

Whereas the Scientific and Technical Research Committee (Crest) has given its opinion,

Has adopted this decision:

Article 1

A Community programme in the field of strategic analysis, forecasting, and evaluation in matters of research and technology (Monitor), as defined in Annex I and hereinafter referred to as "the programme," is hereby adopted for a period of 4 years from....[as published]

Article 2

The funds estimated as necessary for the Community's contribution to the execution of the programme amount to ECU 22 million, including expenditure on a staff of 25.

An indicative breakdown of the estimated total amount between the various programme activities is given in Annex I.

Article 3

Detailed rules for the implementation of the programme and the rate of the Community's financial participation are set out in Annex II.

Article 4

1. In the third year of the programme implementation, the Commission shall undertake a review of the programme and shall report to the European Parliament and the Council on the results thereof, together, if necessary, with any proposals for modification or prolongation.
2. At the end of the programme, the Commission shall report to the European Parliament and the Council on the results achieved.
3. The reports provided for in paragraphs 1 and 2 shall be established having regard to the objective set out in Annex III to this Decision and in conformity with Article 2 (2) of Decision 87/516/Euratom, EEC.

Article 5

1. The Commission shall be responsible for the implementation of the programme.
2. The Commission shall be assisted by a committee of an advisory nature composed of the representatives of the Member States and chaired by the representative of the Commission.

Article 6

1. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft, within a time limit which the chairman may lay down according to the urgency of the matter, if necessary by taking a vote.
2. The opinion shall be recorded in the minutes; in addition, each Member State shall have the right to ask to have its position recorded in the minutes.
3. The Commission shall take the utmost account of the opinion delivered by the committee. It shall inform the committee of the manner in which its opinion has been taken into account.

Article 7

The procedure laid down in Article 6 shall apply in particular to:

- The work programmes drawn up in respect of each of the component parts of the programme;
- The content of calls for proposals or tenders;
- The assessment of the proposed activities and the estimated amount of the Community's contribution to them;
- The measures to be undertaken to evaluate the programme;
- Any adaptation of the internal indicative allocation of funds set out in Annex I, section I (2);
- Departures from the general rules governing Community participation in financing set out in Annex II;
- The participation in any activity by third country organizations or enterprises as provided for in Article 8;
- Arrangements for the dissemination, protection, and exploitation of the results of research carried out under the programme.

Article 8

1. The Commission shall be authorized to negotiate, in accordance with Article 130n of the Treaty, agreements with international organizations, those non-Member States participating in European cooperation in the field of scientific and technical research (COST) and those European countries having concluded framework agreements in scientific and technical cooperation with the Community, with a view to associating them wholly or partly with the programme.
2. Where framework agreements for scientific and technical cooperation between non-Member States and the European Communities have been concluded, organizations and enterprises established in those countries may participate in a project undertaken within the programme.

Article 9

This Decision is addressed to the Member States.

ANNEX I

Community Programme in the Field of Strategic Analysis, Forecasting, and Evaluation in Matters of Research and Technology (Monitor) I. General Aims and Activities

1.a. The purpose of the programme is to be instrumental in identifying new directions and priorities for Community research and technological development policy and to help show more clearly the relationships between R&D and the other common policies. b. The programme involves factual and strategic analysis and forecasting relating to the scientific and technological environment and its interaction with economic and social developments.

2. The programme comprises three activities. The internal indicative allocation of the funds estimated as necessary for each of these activities is as follows:

	(million ECU)
Strategic and impact analysis (SAST)	3.1
FAST forecasting	4.5
Research and studies to improve methodologies and effectiveness of evaluation of R&D activities (SPEAR)	1.8
Still to be allocated	0.7
Staff costs	9.6
Administrative costs	2.3
Total	22.0

II. Content and Working Methods *Strategic and Impact Analysis (SAST)*

3. The SAST activities consist of carrying out "targeted" analyses in a scientific field, technology sector, or a

challenging theme. The aim is to show the options available to the Commission's science and technology policy and interactions with other policies as well as the way in which the different actors concerned (industrialists, certain local public authorities, Member and non-member States, social groups, etc.) situate themselves with regard to the options.

4. The activities consist of:

—a. The preparation of reports on the prospects for development and the strengths and weaknesses of the European Community, a group of countries in the Community, particularly with respect to R&D structures, a high-technology sector, a scientific field or in relation to important changes in other countries' science and technology policies, particularly those outside the Community;

—b. The carrying-out of technology assessments into the state of development of a technology and its future evolution, constraints to innovation, industrial and socioeconomic impact within the Community (by sector, region, etc.), requirements in terms of R&D and investment financing, etc.;

—c. The preparation of reports of strategic analyses (strategic dossiers) shedding light, for a given problem, on alternatives open to the European Community and proposing precise orientations for action.

5. The Commission will establish an annual calendar of priority activities which will be adopted after consultation with the Committee referred to in Article 5 of the Decision. ***FAST Forecasting***

6. The FAST forecasting activities are a reoriented follow-up to previous FAST programmes: they include study of scientific and technological changes and their many interactions with economic and social changes. Their aim is to provide the Commission with global analyses and long-term projections. The projections are to be useful in relation to the Community's major objectives for the 1990s, namely the creation of a single internal market and strengthening economic and social cohesion within the Community, and in the light of worldwide economic and social developments.

7. Forecasting includes:

—a. The preparation of reports (forecasting dossiers) on major topics or phenomena of a global character. The choice of these topics will depend on their relevance and significance in relation to the objectives of the common RTD policy. They may extend beyond the strictly European framework;

—b. The undertaking of studies of the implications and consequences of selected scientific and technical developments which present important challenges for society in the future;

—c. The synthesis and critical analysis of the main forecasting studies published worldwide;

—d. The preparation, every 2 years, of a report on the economic and social implications of technological change, particularly in Europe.

8. These activities will be defined according to a biennial work programme established by the Commission in consultation with the Committee referred to in Article 5 of the Decision.

9. These activities will involve the participation of experts and working groups from outside the Commission under the responsibility and guidance of the FAST team in consultation with other Commission services concerned (including, where necessary, officials from other Directorates-General seconded to the FAST team for limited periods) and visiting scientists on secondment from the Member States or from non-member countries. In addition, the activities under 7 (a) and (b) will be organized in such a way as to ensure the broadest and most efficient possible interaction between the actors involved. To that end, the European Parliament, the Council, and the Economic and Social Committee will be regularly informed of the results of these activities.

10. FAST forecasting activities are also intended to continue to stimulate the development of European forecasting efforts and expertise. To this end, it will be necessary to reinforce the FAST "12 + 1" network (comprising the 12 national FAST units nominated by the Member States to ensure interaction between Community activities and similar work undertaken in their own countries) and to encourage the setting-up of an informal network of European experts in the field of prospection.

Activities in Support of the Evaluation of R&D Programmes (Spear)

11. Research and studies in support of evaluation of R&D activities at the Community level are intended to improve the theoretical and methodological bases, as well as the methods of organization and management of Community R&D programmes within the context of, and drawing as appropriate on, the experience of national and international R&D programmes. Such research and studies will also analyse and improve the effectiveness and impact of R&D activities and define an evaluation procedure applicable to the broad range of research activities at the Community level carried out under the responsibility of the Commission while preserving the quality and independence of such evaluation.

12. To this end, the Spear activities comprise:

- The preparation, in conformity with the Community plan of action relating to the evaluation of Community research and development activities for the years 1987 to 1991, of four to five horizontal evaluations,

within the context of, and drawing as appropriate on, the experience of national or international research programmes, in order to analyse their impact and identify means to improve their effectiveness at Community level. This covers analyses of methods of support and of management of national and Community research.

- Research actions into methodologies of evaluation of R&D programmes in order to increase their utility and make them more credible to their users. This will be in conformity with point 5, 6, and 7 of the aforementioned plan of action.

In particular the programme must:

- Improve methods for evaluations of Community R&D programmes within the context of, and drawing as appropriate on, the experience of related national R&D programmes;
- Stimulate research into the methodology of evaluation and its use in Member States;
- Develop quantitative indicators that can describe the quality and utility of research and its contribution to the Community's economic and social development;
- Prepare guidelines for the carrying-out of Community R&D programme evaluations in the light of the European experience;
- Prepare guidelines for evaluating the quality of management using a set of related criteria (utilization of appropriations, allocation of contracts, meeting of deadlines, etc.);
- Examine the idea of assigning parts of a given evaluation to a working group or contractor to investigate points of detail and to assess the application of results of the research programme in question.

13. The Commission will establish an annual calendar of priority activities which will be adopted after consultation with the Committee referred to in Article 5 of the Decision.

ANNEX II

Programme Implementation

The implementation of the programme will vary according to the specific nature of the activity involved, but will include in particular:

- The involvement of research centers or research teams from the Community countries specializing in strategic and impact analyses, forecasting and evaluation of R&D programmes, especially by setting up networks, organizing workshops, seminars, etc.;
- The setting-up of two "12 + 1" networks, one linked to FAST forecasting, the other to Spear. Their objectives will be the exchange and diffusion of information, promotion within the Community of more effective means of forecasting and of evaluation of R&D, and also the exploitation of results;
- The secondment of visiting scientists from national institutions and governments to take part in the various activities;
- The dissemination of the knowledge and results acquired in the context of the SAST, FAST, and Spear activities in the form of publications in the field of research, policy notes, the organization of national Monitor days, and other publicizing activities.

The above activities will be implemented chiefly by means of contracts for studies and services to be carried out on behalf of the Commission.

The Communities' financial contribution toward the activities in question may be up to 100 percent of the expenditure involved.

The contracts entered into by the Commission shall regulate the rights and obligations of each party, including the methods of disseminating, protecting, and exploiting the research results.

As a general rule, contracts will, where appropriate, be awarded on the basis of calls for proposals or for tenders (restricted or public) published in the Official Journal of the European Communities.

ANNEX III

Programme Objectives and Evaluation Criteria

The general objective of the programme is that its three component parts—SAST, FAST, and Spear—should form as far as possible an integrated whole to achieve the purpose set out in section I.1 of Annex I, namely that it should be instrumental in identifying new directions and priorities for Community research and technological development policy and should help show more the relationships between R&D and the other common policies. The particular objectives of the three component parts are: ***I. SAST***

1.1. The unit should satisfy the demands for strategic analysis expressed by the various services and committees associated to Community science and technology. A calendar of projects to be implemented should be established annually, following consultation of the Committee referred to in Article 5 of the Decision.

1.2. Each SAST project, once selected, should be conducted in such a way as to ensure access and commitment to the exercise, from the definition of the project to the diffusion of its results through the various implementation phases, by all those directly concerned.

1.3. Each project intended to produce a strategic dossier should be supervised by a steering group with the requisite authority, legitimacy, and expertise, involving customer(s)' representative(s), SAST personnel, and external expert(s).

1.4. The strategic dossiers should demonstrate the need, and give precise recommendations, for action and, where appropriate, the conditions under which it could best be pursued. The dossiers should represent a broad consensus among their steering groups.

2. FAST

2.1. The FAST activity should elaborate and implement the two-yearly working programmes to the satisfaction of the FAST interservice group of Directors-General of the Commission, and the national units of FAST 12 + 1 network.

2.2. The FAST activity should have produced two two-yearly reports on the economic and social consequences of scientific and technological change mainly in Europe to the satisfaction of the Commission, the European Parliament, the Council of Ministers, and the Economic and Social Committee.

2.3. The global prospective studies, the FAST technological assessment examples, and the analytical synthesis should be of such a relevance and quality that they have been significantly useful for the Commission orientation not only of Community RTD choices and options but also of other relevant Community policies.

2.4. The prospective activities of FAST should have stimulated the development of European prospective efforts and expertise. Furthermore, the "12 + 1" network should have been reinforced to the satisfaction of both Member States and the Commission.

2.5. An informal network of prospectivists should have been set up. The activities of other FAST networks (such as Eureta or the ROME network which has to be established) should have been supported.

3. Spear

3.1. The Spear activity should lead to the production by the Commission of evaluation guidelines that include criteria to guarantee the relevance, rigour, and independence of the evaluations of Community RTD programmes. These guidelines should be prepared no later than June 1993.

3.2. Approximately one "horizontal" evaluation per year should be performed and these evaluations should indentify potentially significant improvements in the Commission's support mechanisms for R&D.

3.3. As a result of the activities of Spear, the Commission's evaluators should be provided with improved tools for the analysis of the management and impact of R&D programmes.

3.4. Suitable quantitative indicators should be developed in order to provide a valuable contribution to evaluations.

3.5. The activities related to the Spear network should provide a useful support to the evaluation activities of its members and in particular improve the means of evaluating Community programmes.

The programme shall also be evaluated in the light of all the selection criteria set out in Annex III to Decision 87/516/Euratom, EEC which includes that of contributing to the strengthening of the economic and social cohesion of the Community, while being consistent with the pursuit of scientific and technical quality.

Part II: Declaration Annex

Amendments of the European Parliament Not Accepted by the Commission ***Amendment Proposed by the European Parliament*** *Amendment 2—Article 2: New third and fourth paragraphs* Each year the Commission, as part of the annual budgetary approval procedure, shall propose to the budgetary authority that it enter the appropriations intended for the programme with due regard for the actual requirements of the financial year concerned and the financial estimates as set out in the Inter-Institutional Agreement. The Commission shall state in the Annex what proportion of the expenditure per programme relates to temporary officials, regardless of grade, and what proportion to collaborating researchers. ***Common Position of the Council***

Although the Commission recognizes, in principle, the opportunity to specify in research programme decisions the relationship between the term "amount deemed necessary," the budgetary procedure, and the insitutional agreement on budgetary discipline, it considers untimely the introduction of such a new provision for proposals already submitted as this could delay the adoption of the programmes concerned.

As regards the second part of this amendment, the Commission has not included it as it is not possible at the date of the programme proposal to indicate the number of collaborating researchers who will participate in the programme.

Amendment Proposed by the European Parliament *Amendment 4—Annex I* I. General Aims and Activities Paragraph 1, new third subparagraph c. The programme shall form an integral part of the procedure for the revision of the framework programme of Community research and technological development.

Common Position of the Council This amendment is not accepted by the Commission which considers it to be redundant with the first subparagraph (a) of this same paragraph 1.

Most EC States Favor New Framework Program

AN890223 Brussels IRDAC NEWS in English
Jun 89 p 4

[Article: "A New Community R&D Framework Programme"]

[Text] A majority of the national governments are in favour of a new Community R&D Framework Programme, as suggested by the European Commission, which would take account of the new strategic requirements (environment, health, etc.) and would be able to provide yet more support for the competitiveness of European industry on the international scene.

This is the main lesson learnt from the first part of the discussions at the Research Council held on 14 March 1989 by the Twelve in Brussels. Mr Pandolfi, vice-president of the Commission, confirmed on this occasion that he hoped to have the new strategic Community R&D concept adopted politically during the French Presidency in the second half of 1989. If this were the case, a new multiannual Framework Programme could carry on from the present programme (1989-91) well before the end of that programme.

The vice-president also said that the Twelve should base their discussions on six crucial points:

- Community-level R&D should continue to be directed towards the "precompetitive" area. The "market threshold" should not be crossed.

This did not rule out a gradual decrease in Community action the closer the "market threshold" was approached (e.g. during the research phase known as "pre-industrial", including pilot and demonstration projects).

- Concentration on a number of strategic topics. The Community should give preference to a horizontal approach taking more account of those technologies which span whole series of industrial, traditional and new activities.

- Cooperation with other programmes (EUREKA, national and international programmes).

- R&D known as "prestandardizing", i.e. that paving the way for European norms and standards (for example, on the environment).

- Support for the European scientific community: This must be considered as a crucial aspect of utilizing European talent.

- Decentralized management: Although it is clear that permanent monitoring of the Community's R&D activities must be carried out by the European Commission's departments, it is on the other hand conceivable that management will be decentralized in the field.

The Council also received confirmation that matters relating to the funding, duration and, indeed, the nature of the future strategic R&D concept could only be tackled after the priorities and needs had been identified by the Twelve and by the European Commission.

EC Finances Italian Research for European Projects

MI890283 Turin MEDIA DUEMILA in Italian
May 89 p 42

[Article by Giampiero Gramaglia: "Financial Assistance to Italy for EUREKA"]

[Text] The European Commission has authorized the allocation of funds for Italy's participation in three EUREKA [European Research Coordination Agency] projects. This program for European research is extended to 19 countries: members of the EC, the EFTA [European Free Trade Association], and Turkey.

The funding covers the EPROM project for the study and development of integrated circuits with non-volatile memories and a storage capacity of 4 to 16 megabytes, a robotized drilling system capable of lowering drilling costs by 50 percent, and the Prometheus project for the development of an efficient highway system that safeguards the environment and can guarantee unprecedented levels of safety.

Italian participation in the EPROM project will involve SGS Microelectronics for a total of 172.5 billion lire; more than 59 billion of this amount can be covered through public loans. The robotized drilling system will involve Massarenti for a total of 11 billion lire with public funding of 3.6 billion lire. Finally, the Prometheus project will be led by FIAT and will be carried out by companies in the group (FIAT Research Center, Telettra - Electronic Telephones and Radio, Veglia, Borletti). Participation will amount to approximately 28.7 billion lire and funding will cover 44.1 percent of this amount.

IRDAC Assesses EC S&T Report

AN890222 Brussels IRDAC NEWS in English
Jun 89 pp 1-3

[Editorial by the Industrial R&D Advisory Committee (IRDAC) of the EC Commission: "The European Commission's First Report on the State of Science and Technology in Europe: IRDAC's Views"]

[Text] The initiative of the Commission in publishing this report is welcomed and the opportunity to comment in it is gratefully appreciated by IRDAC. Its members, who represent industry in a personal capacity, feel that the current report is the beginning of a process which must necessarily continue over the years to come. The idea of revising the report at regular, but not too long, intervals is one which IRDAC welcomes since the report is an important work and will provide guidance for the Commission's choices in the future.

The information and analysis provided in the report rightly emphasizes the importance of technology and research for the future of Europe and the efforts which will have to be made to exploit their potential. In industry, R&D programmes are determined by management through a process of consultation with all the relevant parts of the company, including research, production, marketing, and sales. Future versions of the report would benefit from a similar kind of structured consultation, not only with scientists but also with industrialists and other social partners. Such a process will ensure that future reports are not limited to the areas covered by the ongoing Community Framework Programme, which is the case with the First Report, and will lead to an improved analysis of the markets for the technologies under consideration. In this way, the priorities outlined in the report will result from the sounder basis of demand for technology rather than technology supply. For industry, the general goals which guide the definition of R&D programmes are, of course, competitiveness and profitability; for Europe as a whole the aims will be related to a number of key problems, including:

- Under-employment, competitiveness of the industrial and service sectors;
- The low productivity of the educational system;
- Industry's use of scientific research;
- The environment and the quality of life;
- Energy and raw materials;
- The population and ageing;
- Technology transfer;
- Quality and standardisation.

By using the structured technology demand approach outlined above, it should also be possible to ensure that important, rapidly growing industrial sectors and areas of technology are included in future. Amongst important areas which should have been included or given more in-depth treatment in the current report are the packaging, food, and construction industries, marine technology, and raw materials.

It was felt that the report's concentration on the innovation "chain" from basic research through development to production is not a helpful way of viewing the innovation process. The most important task for industry is the improvement of existing products and processes and the development of new ones. Technological innovation, which is the successful bringing to the market of products using new technologies, or incorporating existing technologies in a novel way, is one important part of this process. R&D is just one facet of technological innovation, aimed at the creation of new technologies whereas the whole process is complex, with a permanent integration and interaction of different kinds of activities. As noted above, decisions have to be made by collaboration between engineers, researchers, marketing, production, etc., and each of these plays an important part in all stages of the process.

The report also fails to distinguish adequately between the characteristics and aims of fundamental and industrial research. Fundamental research has the essential and legitimate objective of contributing to the sum of knowledge in the world at large and is the responsibility of public authorities and obviously connected to education. Industry has need of this knowledge, as does the rest of society, to guide its possible future developments. On the other hand, industrial research, which can be of a very fundamental nature, has the aim of contributing to the technological base of the company and thus to its economic performance. It is performed primarily to give the company a competitive edge.

Recommendations

1. Compared with its major competitors, Europe as a whole does not invest a high enough proportion of its GDP in research and development. Within Europe there are notable differences in R&D performance, such as between the North and the South. In IRDAC's view, there is a need to:

- Increase the funding of fundamental research;
- Redeploy effort within fundamental research towards technological disciplines.

Examples of the technological disciplines in which fundamental research is required are applied mathematics, corrosion and process technologies. Such knowledge is a basic requirement of industry and help must be given towards the development of industrial research in each country through measures such as those in place in Germany. Emphasis should be placed on the basic industries and production technologies.

2. Industry's needs are best served by maintaining a sound and open public basic research structure from which commercial technologies can be developed by industry itself. IRDAC's principal message is that the strengthening of the scientific research base is essential to improve Europe's competitiveness. Good academic researchers should not be required to go into short-term application work, either to obtain funds or promotion. Industry has a need of good scientists, but not amateur technologists. Whilst building large research groups is often necessary to address interdisciplinary themes, it is most important that stable support be provided for gifted individuals and small teams. It is strongly felt that the answer to multidisciplinary problems is not the creation of large centralized teams but rather the development of good networks of high-class researchers; policy flexibility is highly important. In this way, it is hoped that disconnected national reactions to the new problems, such as those which were developed to deal with high temperature superconductivity, can be avoided.

3. International cooperation in fundamental research will continue to grow in importance relative to purely national research efforts. Coordination of such research will be necessary to avoid unnecessary duplication of

effort and the maintenance of competition will be needed in order to keep the quality of the research high. The Commission will have an important role to play in assisting this coordination and encouraging collaboration whilst avoiding unnecessary extra bureaucracy.

4. Overall, the management of technical resources is not well developed in European industry. Small and medium-sized enterprises (SMEs) in the traditional areas of industry are often weak in this area as are many larger companies. Many of these companies do not have a tradition of analysing and evaluating their portfolio of technologies in order to elaborate a research or technology acquisition strategy. IRDAC recognizes that more effort will need to be devoted to developing technological management in Europe but warns against the use of inappropriate management systems which can stifle creativity. In this respect, IRDAC notes with approval the role played by the European Industrial Research Management Association (EIRMA) in providing a forum for discussing management training. EC programmes could be a good vehicle for helping SMEs improve their management in this field.

5. For many companies a goal is not to perform research in order to develop new technologies but to be aware of the opportunities arising from technologies, particularly emerging technologies. Buying technology rather than developing it can be a very cost-effective contribution to innovation. Smaller companies face particular problems in this area and IRDAC has looked at a number of ways of helping small companies; the feasibility awards in the BRITE programme are an interesting development resulting from IRDAC recommendations. An IRDAC task force is currently examining a proposal for a programme of cooperative research involving smaller companies, research associations, and institutes and will advise the Commission in due course.

6. IRDAC notes the considerable importance of production technologies, such as computer integrated manufacturing (CIM), to European industry and the problems of integrating these new technologies into companies, particularly smaller enterprises. IRDAC feels that there is a strong need for good courses in manufacturing systems engineering and management that meet industrial needs. IRDAC recommends that demonstration projects be set up for such courses containing a high training content rather than research. This is particularly important if such courses are to be of use to smaller companies and industry itself should take the lead in developing such courses. Community assistance is likely to be required to help the courses get started but it is expected that they will be self-financing within a short period of time. A good model in this repsect is the integrated series of mechatronics courses developed jointly by IRDAC and the Commission.

7. Leaving aside the fact that Europe produces less than half the trained engineers per head of population than does Japan, IRDAC recognizes that demographic changes will add to shortages of supply of technically trained manpower in the years to come. This general difficulty of finding suitably technically qualified people applies to all disciplines and to all levels, including technicians and specialist engineers. With the exception of very few Member States, Europe does not have a correct balance in its community of scientists and technologists to deal with the science and technology issues industry faces in the future. IRDAC is also concerned that Europe is not making full use of the whole of its potential workforce. In particular, enhancing the potential of the less-favoured regions would benefit the whole of Europe. Such enhancement could be brought about through improvements to the research infrastructure in these areas and schemes to promote mobility of researchers and teachers. The importance for Europe of sound craft skills and a good craftwork career structure (such as are promoted by the German system of Gesellen and Meister) should not be underestimated. In addition, the largely untapped potential of women should not be overlooked when planning training schemes.

The issue of training the workforce to be able to implement and adopt new technologies is of vital importance to industry and is one that is at the heart of problems over the low productivity of European industry's use of technology. In the coming years much more flexibility will be required, particularly in the retraining of mature people. IRDAC has recently set up a new working party to look at education and training issues.

8. Without coordinated standards, regulations, and product approval procedures, it will not be possible to achieve a unified market in 1992. It is recognized that much is happening at the European level to strengthen standards-making activities but IRDAC feels that there is still room for extra effort. In particular, attention will need to be given to the important area of pre-normative research in order to provide the conditions in which applied research and investment can go ahead on a European scale. Among the many areas where pre-normative research is highly important biotechnology, broadband telecommunications, the environment, and food can be cited. IRDAC feels that the Joint Research Center of the European Communities could play an increasingly important role in certain instances.

9. With the advent of the single market, it will be increasingly necessary in the forthcoming years to reflect on the future organisation of research within Europe. As noted in paragraph 3, the Commission will need to be more actively involved in coordinating the work of national research councils as well as organisations involved in cooperative research. In addition to this coordination, IRDAC feels that there will be a need for some central funding of initiatives in new fields, such as fundamental engineering research. Centrally-funded research of this nature would help less-favoured regions participate in high quality research through competing for grants. It could also help to reinforce areas where strengthening of European research is required, such as

inorganic chemistry and microbiology. A proposal which in IRDAC's view merits consideration would be the setting up of a European Science and Engineering Research Assembly. Such an assembly could assist in administering new initiatives of the kind mentioned above.

10. In addition to the role outlined in the previous paragraph, a European Science and Engineering Research Assembly could play an important role in helping to develop cooperation on fundamental research. But cooperation is also needed in other fields and it will be a particular task for the Commission to reinforce intra-European liaison between universities and industry, whilst respecting the different nature and purpose of the partners. Cooperation between competing companies merits careful attention. IRDAC recognizes that over the last ten years or so, there have been many developments in inter-firm cooperation. However, initiatives aimed at promoting cooperation between European enterprises should take account of the fact that competition between firms is normal and is indispensable for the health of industry. Initiatives which ignore this basic fact of business life by pushing cooperation into competitive areas of research will not succeed.

To conclude, IRDAC feels that, through the exercise of revising this report regularly, the Commission should help the whole of the Community to take a more strategic view of the importance of science and technology. Future editions of the report will need an improved analysis of the actions of Member States in order to guide priority setting. The process of identifying technological needs outlined in the introductory paragraphs should ensure that future versions of the report reflect the state of science and technology accurately and provide a sound basis for the strategic choices that will have to be made on both Community and national research programmes.

FRG: BMFT's Medium-Term Budget Presented

MI890321 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 504, 29 May 89 pp 4-5

[Text] According to the recently approved medium-term financial plan, annual growth rates of around 2.5 percent are expected for the BMFT [FRG Ministry of Research and Technology] budget. In 1992, the BMFT should have a total of DM8.243 billion at its disposal. Aerospace research will develop into the largest single funding area, its allocation amounting to almost 20 percent of the total BMFT budget. The following tables summarize the medium-term financial plan of some selected funding areas:

Table 1: Selected Funding Areas

Amount, in DM millions	1987	1988	1989	1990	1991	1992
Total budget	7,240	7,564	7,645	7,846	8,042	8,243
Aerospace research	1,058	1,188	1,291	1,458	1,557	1,640
Energy research	1,388	1,394	1,351	1,354	1,380	1,374
Environmental research	386	418	441	442	476	503
Computer science	834	812	780	781	776	784
Biotechnology	205	226	228	238	258	281
Materials research	196	211	216	231	239	256
Physical technologies	132	166	217	232	254	282
Aeronautical research	182	196	207	219	226	229
Innovation, general requirements	187	225	188	149	98	48
Including:						
Grants to young researchers	58	80	55	40	20	0
Research contracts	52	62	58	40	34	25
Research cooperation	19	21	21	21	21	21
TOU [grants for technology-oriented firms]	54	56	50	45	20	0
Technology transfer	4.6	6.0	4.0	3.0	2.5	2.0

Table 2: Funding Categories

Amount, in DM millions	1987	1988	1989	1990	1991	1992
Total budget	7,340	7,464	7,645	7,846	8,042	8,243
Basic research involving more than one program	1,527	1,566	1,594	1,572	1,616	1,647
Long-term programs	1,377	1,548	1,655	1,844	1,936	2,032
Preventive research	897	973	1,013	1,028	1,067	1,132
Market-oriented technology funding	3,052	3,127	3,071	3,113	3,176	3,227
Including GFE [large research institutes]	853	913	919	974	990	1,019
General requirements, infrastructure	428	476	439	412	371	331

FRG: New BMFT Subsidy Policy for Small, Medium-Sized Firms Outlined

MI890320 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 504, 29 May 89 pp 2-3

[Text] FRG Research Minister Riesenhuber has presented the government's new overall policy on research and technology for small and medium-sized firms in Bonn. According to Riesenhuber, it will provide a solid foundation for financing research and development in small and medium-sized firms in the years to come, as it is constantly adapted to take account of new requirements. The following table provides an overview of the measures that the BMFT [FRG Ministry of Research and Technology], the BMWi [FRG Ministry of Trade and Industry], and the BMBW [FRG Ministry for Education and Science] will take to fund research and development in small and medium-sized firms:

FRG Government Measures for Funding Research and Development in Small and Medium-Sized Firms

Purpose of the measures	Measures	Prospective 1989 funding, in DM millions
Enhancing in-house technical developments	BMFT project funding under specific programs (especially joint projects)	200
	Indirect-specific BMFT measures	114
	Establishment of technology-oriented firms (BMFT)	50
	Personnel cost subsidy (BMWi) and funding of additional research personnel (BMFT)	105
	Small and medium-sized firms in Berlin (BMWi)	7
Support for cooperation with science	Joint industrial research (BMWi, including specific program-oriented project funding by the BMFT)	139
	Contract research and development (BMFT)	58
	Research cooperation between industry and science (BMFT)	21
Establishment of a technology transfer market for medium-sized firms	Centers providing information and consulting services on new fields of technology (BMFT)	27
	Technology transfer capacity in public research institutes (BMFT, BMWi, BMBW)	*
	Technical information (BMFT, BMWi)	14
Innovations-oriented qualifications	University courses (BMBW)	*
General conditions conducive to innovation	Standardization to keep pace with development	*
	Removal of barriers to innovation	*
	Public procurement	*
	Total	735

*impossible to render statistically

The BMFT measures contained in the recently-announced policy emphasize the following aspects:

- Increased participation of small and medium-sized firms in joint projects; for example, the administrative simplifications that came into force in January 1989 (including flat-rate deduction procedures) should help medium-sized firms make greater use of joint research. In 1989, subsidies to small and medium-sized firms from specific programs are expected to reach DM230 million;
- A targeted use of indirect-specific funding programs (1989 budget allocation: DM114 million for computer science, manufacturing technology, and biotechnology), so that new technologies can be used extensively and effectively. Since 1988, when the indirect-specific program designed to promote the use of CIM was started, 1,700 applications have been received, 90 percent of which were from small and medium-sized firms;
- A new system of grants for setting up technology-oriented firms; a new FRG-wide model experiment is currently being drawn up, the main criterion being to mobilize more private share capital for such firms. DM50 million has been earmarked for funding technology-oriented firms in 1989;
- A new formula for "contract research and development" (subsidies for research and development contracts awarded to third parties), designed to achieve increased cooperation between small and medium-sized firms and science and engineering firms. Multiple funding is limited to a maximum of three subsidies, and an overall ceiling of DM150,000 per company has been introduced to distribute the incentives across a broader base (1989 budget allocation: DM58 million). It is hoped that more companies, primarily small firms that have never received subsidies to date, will thus be attracted;
- A continuation of the tried and tested funding measures known as "Research Cooperation Between

Industry and Science," i.e., grants to industrial firms that send their young scientists to universities or research institutes for a set period (maximum 3 years) (1989 budget allocation: DM21 million);
- A consolidation of the Fraunhofer Society, whose research capacities have expanded more than average in recent years. Although two-thirds of the society's industrial contracts already come from small and medium-sized firms (for a total value of about DM35 million), there is certainly still room for improvement. The Fraunhofer Society's contract research, range of services, and research infrastructure will be further expanded with an eye to small and medium-sized firms, particularly with regard to computer-aided quality control). The Fraunhofer institutes are playing an increasingly important role in bridging the gap between science and industry;
- Setting up additional demonstration centers for information and advice on new fields of technology, presenting "direct contact with technology" on an impartial, wide-ranging basis. They include 16 CIM centers and eight centers covering materials research (1989 budget allocation: DM27 million).
- Increasing the importance of information as a production factor; a new specialized information program is currently being drawn up;
- Promoting the craft industries, for example, by setting up special demonstration centers and adapting new technologies to the needs of craft industries.

New Activity Policy for FRG Aerospace Agency Established

MI890306 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 503, 19 May 89 pp 3-5

[Text] Prof Wolfang Wild, currently the Bavarian state minister for science and the arts, is the first general director of the new FRG Space Agency, DARA. Professor Wild, a pure physicist, has long been involved in successful scientific and research work as well as in research management. He has also significantly contributed to the restructuring of the Universities of Bayreuth and Regensburg. He was elected President of the Technical University of Munich in 1980 and was reelected in February 1986 for a second term expiring in 1990. In October 1986 he became the Bavarian state minister for science and the arts.

He will now be responsible for the rapid implementation of the part of the Cabinet resolution of 26 April 1989 concerning the reorganization of German space management, i.e., the foundation of DARA. More specifically, the Cabinet decided to adopt the following measures to reorganize space management:

- The establishment of a Cabinet Space Committee under the chairmanship of the federal chancellor, with the federal minister of research and technology as acting chairman;
- The establishment of a State Space Committee at the State Secretary level under the leadership of the BMFT [FRG Ministry of Research and Technology];
- The establishment of DARA, the FRG Space Agency.

At the federal level, the ministries directly involved in space activities (BMFT, the Ministry of Defense, the Ministry of Transport, and the Ministry for Post and Telecommunications), those that are participating (the Foreign Ministry, the Ministry of Finance, and the Ministry of Trade and Industry), as well as the Federal Chancery are represented on both committees. The Cabinet Committee will act as an advisory body when decisions of principle on space policy are made, and it will coordinate program priorities and budget resources. The State Secretary Committee reporting to the Cabinet Committee will be responsible for the standing coordination of the various federal ministries' space affairs, particularly in relation to DARA.

DARA has the following executive tasks:

- Planning FRG space activities;
- Managing the implementation of German space programs, including budget control;
- Promoting FRG space interests at the international level, primarily vis-a-vis the European Space Agency, ESA.

DARA's autonomy is based on the federal ministries' delegation of responsibility for all nonministerial management tasks, even sovereign tasks such as approving grants. This underlines the need to enact a law conferring responsibility for space activities, which would break new ground at the political and institutional levels. The BMFT will table such a bill once DARA has been established. Until the new law comes into force, DARA will work within the bounds of the existing legal situation. The agency will first set up its organizational structure and delegate responsibility for space research and space technology projects to the FRG Research Establishment for Astronautics and Aeronautics (DLR).

DARA will proceed in line with the general proposals and guidelines issued by the State Secretary Committee which represent a consensus of the various ministries. Ministerial responsibility on space policy is not affected by DARA, since the Federal Government and/or the ministries will continue to be responsible for space policy decisions and governmental tasks.

DARA's efficiency is ensured by its private status and by contract funding, which also result in industry-oriented management. This primarily means flexibility, especially with regard to the employment opportunities offered by DARA, which attracts applicants from industry. That is also the reason why DARA's organizational chart is not predetermined. DARA's employment capacity will be gradually expanded, drawing on experienced personnel from the DLR. DARA will have a staff of about 60 until the end of this year, increasing to about 300 over the next few years. In this respect, the DLR's R&D and operating

equipment work remains unlimited. The DLR and DARA will conclude a cooperation agreement.

Despite its private status as a limited liability company, DARA's neutrality as an instrument of the Federal Administration is guaranteed de jure and de facto. As a neutral organization of the Federal Government (with private status), DARA will not accept contracts from science or private industry. DARA will administer all space project funding on behalf of the government, the budget resources required to carry out programs having been placed under its control. Estimates of these resources are submitted in advance by the individual ministries under the normal budgetary procedures, thus ensuring full parlimentary control.

The budgetary committee approved the Federal Government's proposal to establish DARA on 11 May 1989 with the votes of the groups forming the coalition and the Social Democrats. Although the Green party voted against the proposal, the other groups voted in favor, while some concern was voiced about specific points. They also announced that the project would be subjected to a critical review after 2 years to determine whether it has been successful.

DARA's registered headquarters will be in Bonn. According to the statement made by the federal chancellor during the Ruhr Conference in spring, 1988, the company will operate in North Rhein-Westfalia, near the seat of the Federal Government.

SUPERCONDUCTIVITY

Siemens Superconducting Generator Described

AN890166 Zellik TECHNIVISIE in Dutch
19 Apr 89 pp 10-13

[Article by O. Arkens and A. Calders: "New Materials: Superconducting Generators"]

[Excerpts] The rating of turbogenerators increased from less than 100 MVA in the early 1950s to 1,600 MVA for four-pole generators in nuclear power stations. This increase is largely due to a more efficient use of materials, resulting in reduced generator weight and improved material design and cooling systems. The generator weight has thus been reduced from 2.5 kg/kVA (in air-cooled generators of up to 250 MVA) to less than 0.5 kg kVA for hydrogen- and water-cooled generators of up to 2,200 MVA.

This weight will be reduced even more dramatically through the use of superconductivity. Siemens Muelheim has been studying superconducting DC generators since 1972. By 1995, the first 850-MVA superconducting generator will have been built and thoroughly tested. TECHNIVISIE visited the research center in Muelheim and talked to Dr Eng Manfred Liese, who is in charge of superconducting generator research, and to his colleague, Dr Eng Tadeusz S. Kulig. During our visit to the huge assembly halls in Muelheim, we ascertained that the construction of the superconducting generator had already reached an advanced stage.

Siemens Ahead in Research

In Germany, Siemens is extremely active in this field. The first feasibility studies on superconducting generators were begun in Muelheim as early as 1972 under the impetus of D. Lambrecht, who is in charge of the construction department in the Muelheim turbogenerator plant, and of our host, M. Liese, head of the mechanics development department.

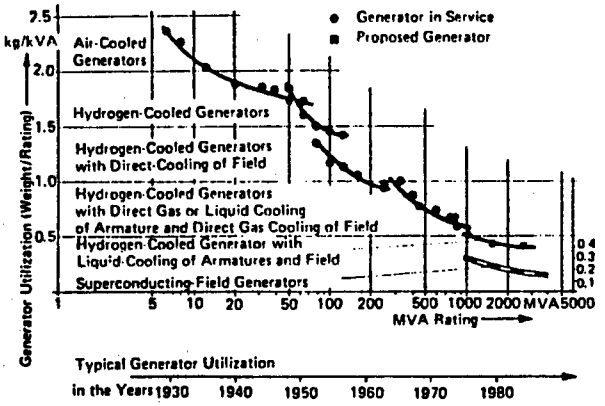
In 1983, a rigorous 5-year program on superconducting generators was initiated. It focused on the development of powerful DC generators with ratings ranging from 2000 to 2500 MVA (superconductivity is currently only used in direct current applications).

Instead of building small machines (with only a few MVA) as test models, Siemens immediately decided to build a machine that could be readily applied to industry. This approach was adopted because it appeared from the preliminary study that liquid-helium-cooled superconducting generators only become cost-effective at ratings above 800 MVA. In addition, Siemens understood that large superconducting machines cannot be built simply by scaling up smaller test models.

Finally, it was decided to develop a generator with a superconducting rotor and water-cooled stator for a 850-MVA machine.

In the first stage, the stator for the 850-MVA machine is equipped with a rotor with superconductive windings, which can generate a rating of 400 MVA. This machine is currently under construction. Initial testing will begin in early 1990, and the test results will serve as a reference point for the construction of the 850-MVA rotor. Once the 400-MVA unit test program has been concluded, Siemens will equip the industrial prototype with a 850-MVA rotor and will begin new tests. This prototype, which has almost certainly found a buyer, is scheduled to be operational by 1995, thus putting Siemens way ahead of other research programs.

Evolution of Turbogenerator Weight per Unit of Power



. leaving the coupling cylinder is led into a duct where it functions as a heat exchanger to cool the system's outer components.

The rotor's NbTi windings must be able to withstand the centrifugal forces of a 3,000-RPM rotation, and they must be resistant to high magnetic field strengths.

Another essential divergence from conventional generator design is the stator's shape. The extremely high magnetic field strength (up to 6 tesla) changes the magnetic field to such an extent that an adaptation of the stator's design is needed. The air gaps must be considerably reduced. They are filled with copper, allowing more current to be carried, which is definitely an advantage. The high magnetic field intensities produce higher eddy current losses in the copper lines, resulting in higher heating. By reducing the total losses to about 50 percent of a normal alternator's level, efficiency is improved by approximately 0.8 percent.

High-technology Research

The superconducting turbogenerator developed by Siemens-Muelheim is a high-technology masterpiece. The superconducting NbTi-alloys used for the rotor's coils enable the current to flow without any loss. This electric current is much higher than with conventional conductive materials. The result is that only half the construction volume and half the material are required to develop the same power. Siemens has calculated that with an annual, full-load operation of 6000 hours, a superconducting 850 MVA system produces 25 million kW-hours more than a conventional turborgenerator, resulting—according to Siemens spokesmen—in a cost improvement of 2.5 to 3 million DM.

The development costs for the 850 MVA prototype, covering the period between 1970 and hand-over in 1995, will amount to 140 million DM. A customer has already been found for the prototype; he will fund the conventional 850 MVA generator. Siemens will have to cover the remaining 90 million DM, about 40 million DM of which will be contributed by the FRG Ministry of Research and Technology.

TECHNOLOGY TRANSFER

Italy, USSR Sign Software Agreement

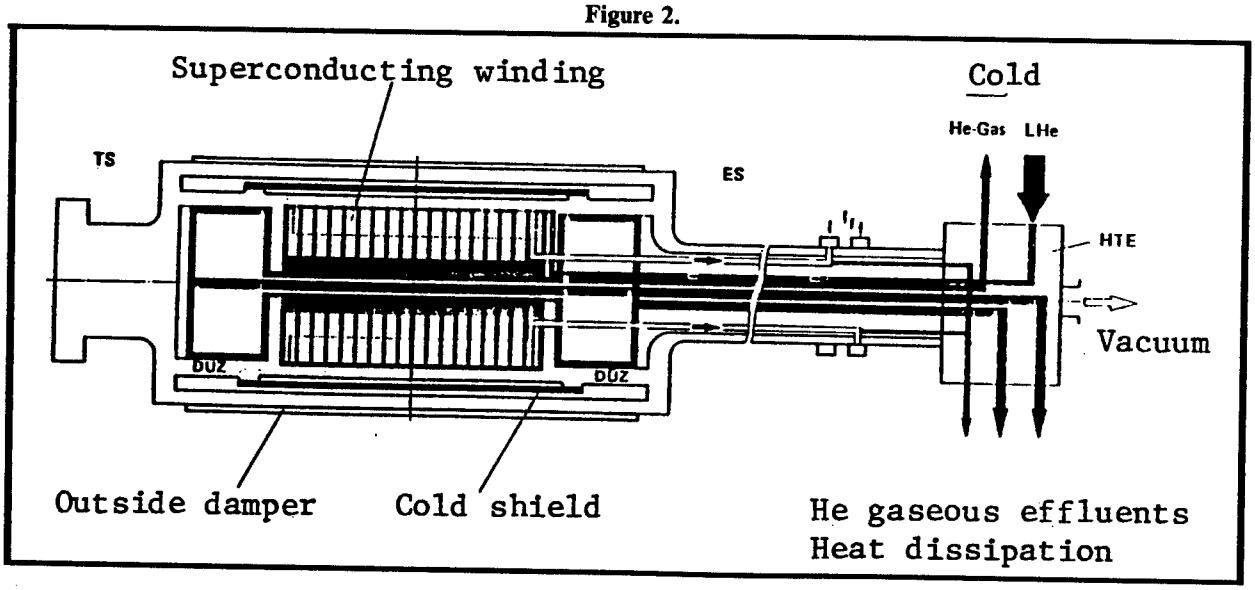
MI890287 Milan ITALIA OGGI in Italian 26 May 89 p 19

[Text] Finsiel, IRI's [Institute for Industrial Reconstruction] financial holding company for the production and development of software has reached a cooperation agreement with the USSR state committee for computers and computer science. The memorandum of understanding was signed in the company's Rome office yesterday by Finsiel's President Alessandro Alberigi Quaranta and by E.P. Maksokov, vice president of the Soviet agency and head of the 14 member delegation.

The areas of cooperation between the two parties will cover application systems, the development of system software and software for telecommunications networks, engineering technology for software production, and professional and management training within the Soviet public administration.

Finsiel's managing director, Vittorio Salvati, pointed out that the agreement is of special importance for two reasons: it has been signed with the leading Soviet authority in the field of computer science, and because of the magnitude and importance of the selected areas of cooperation. Finsiel is Italy's major software company and one of the largest in Europe, with 14 operational companies and more than 5,000 employees.

Figure 2.



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